8.6 BALTIMORE CITY

This chapter presents information about stream conditions of potential management interest in Baltimore City based on the 2000-2004 Maryland Biological Stream Survey (MBSS) results. Information from MBSS data collected between 1994 and 1997 can be found in MDNR 2001d.

8.6.1 Ecological Health

Based on the three ecological health indicators used by the MBSS, the overall condition of Baltimore City streams during 2000-2004 was Poor (Figure 8-33). The FIBI results indicate that 19% of the streams in the county were in Good condition. However, the BIBI results indicate that no streams were rated as good. Using the combined indicator (CBI), 81% of the streams in the city scored as Poor or Very Poor, and 19% scored as Good. There was no apparent geographic trend in stream health in Baltimore City. The highest-rated stream in Baltimore City using the Combined Biotic Index (CBI) was Jones Falls near the county border, while the lowest-rated streams included Stony Run, Chinquapin Run and Moores Run (Table 8-11). Based on Stream Waders volunteer data, all watersheds in the city rated as Poor or Very Poor for benthic macroinvertebrates (Table 8-12).

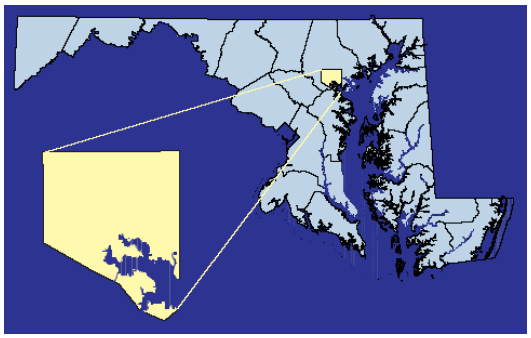
8.6.2 Physical Habitat

8.6.2.1 Overall Condition

Based on the Physical Habitat Index (PHI), only 6% of the streams in Baltimore City had Minimally Degraded habitat, 6% had Partially Degraded habitat, and 88% had Degraded or Severely Degraded habitat (Figure 8-34). The Gwynns Falls watershed had the highest rated site in the city for physical habitat, and also had a higher concentration of Minimally Degraded streams than the rest of the city streams. Based on MBSS sampling, degraded physical habitat is an important problem in Baltimore City streams.

8.6.2.2 Trash

No streams in Baltimore City were rated Optimal for trash and 67% were rated as being in Poor condition (Figure 8-35). No geographic trend was evident in the trash rating data; trash levels appear to be high in nearly every stream reach in Baltimore City. Although most trash in streams does not pose a direct threat to living organisms, it is an indicator that other, more serious items such as used oil, anti-freeze, and other pollutants are being dumped into streams along with the visible trash. Some of the common components of trash along streams, such as used syringes, are also indicators of a human health problem.



8.6.2.3 Channelization

Nearly 41% of the stream miles in Baltimore City had some degree of channelization (Table 8-4). Concrete was the most common type of channelization (28%), followed by rip-rap (6%) and gabion baskets (6%). There was no apparent geographic pattern in channelization in Baltimore City (Figure 8-36).

8.6.2.4 Inadequate Riparian Buffer

Over 9% of the stream miles in Baltimore City had no riparian buffers during the 2000-2004 MBSS (Table 8-3). In addition, 44% of stream miles had severe breaks in existing riparian buffers. Because of the relatively low number of MBSS sites in Baltimore City, there was no apparent geographic pattern in the distribution of sites with inadequate riparian buffer; most of the sites sampled had at least some buffer (Figure 8-37). In contrast, severe breaks in riparian buffers were a common feature at sites sampled, with the possible exception of Gwynns Falls. Additional information about buffer breaks, analyzed by county, is provided in: 2000-2004 Maryland Biological Stream Survey Volume 10: Riparian Zone Conditions (http:www/dnr/Maryland.gov/streams/pubs/ea05-7_ riparian.pdf).

8.6.2.5 Eroded Banks/Bedload Movement

About 77% of the streams in Baltimore City were rated as Optimal for bank erosion, and the remaining 23% were rated as Poor (Figure 8-38). A contributing factor to the lack of eroded banks in the city is the amount of stream miles with banks that have been artificially hardened with concrete, gabions, or rip rap material. Because of the low number of MBSS sites in the city, no geographic pattern in bank erosion was evident.

Over 53% of the stream miles in Baltimore City were rated as having no or only minor bar formation (Figure 8-38). A total of 6% of streams were rated as having extensive bar formation. Again, because of the low number of MBSS sites in Baltimore City, no geographic patterns in bar formation were evident.

8.6.3 Key Nutrients

8.6.3.1 Nitrate-Nitrogen

All of the stream miles in Baltimore City had nitrate-nitrogen levels above the 1 mg/l threshold for forested streams (Figure 8-39). However, no streams had levels above 5 mg/l, the threshold beyond which biological impacts have been documented. There was no geographic trend in nitrate-nitrogen levels.

8.6.3.2 Total Phosphorus

About 44% of all stream miles in Baltimore City were at or below background levels for total phosphorus (Figure 8-40). In contrast, 9% of streams had values greater than the level associated with biological impacts. Because of the low number of MBSS sites in Baltimore City, no geographic trend could be defined.

8.6.4 Stream and River Biodiversity

To provide a means to prioritize stream systems for biodiversity protection and restoration within each county and on a statewide basis, a tiered watershed and stream reach prioritization method was developed. Special emphasis was placed on state-listed species, stronghold watersheds for state-listed species, and stream reaches with one or more state-listed aquatic fauna. Fauna considered included stream salamanders, freshwater fishes, and freshwater mussels. Rare, pollution-sensitive benthic macroinvertebrates collected during the 1994-2004 MBSS were also used to identify the suite of watersheds necessary to conserve the full array of known stream and river biota in Maryland. A complete description of the biodiversity ranking process is found in: 2000-2004 Maryland Biological Stream Survey Volume 9: Stream and Riverine Biodiversity (http: www/dnr/Maryland. gov/streams/pubs/ea05-6_biodiv.pdf).

Of the four watersheds found in Baltimore City, the highest rated for stream and river biodiversity was Bodkin Creek/Baltimore Harbor, a Tier 5 watershed (Figure 8-41). In contrast, the Back River watershed was the lowest ranking for stream and river biodiversity in the city, and nearly in the state (80th of 84). Any reaches that had either state-listed species or high intactness values were highlighted to facilitate additional emphasis in planning restoration and protection activities.

8.6.5 Stressors

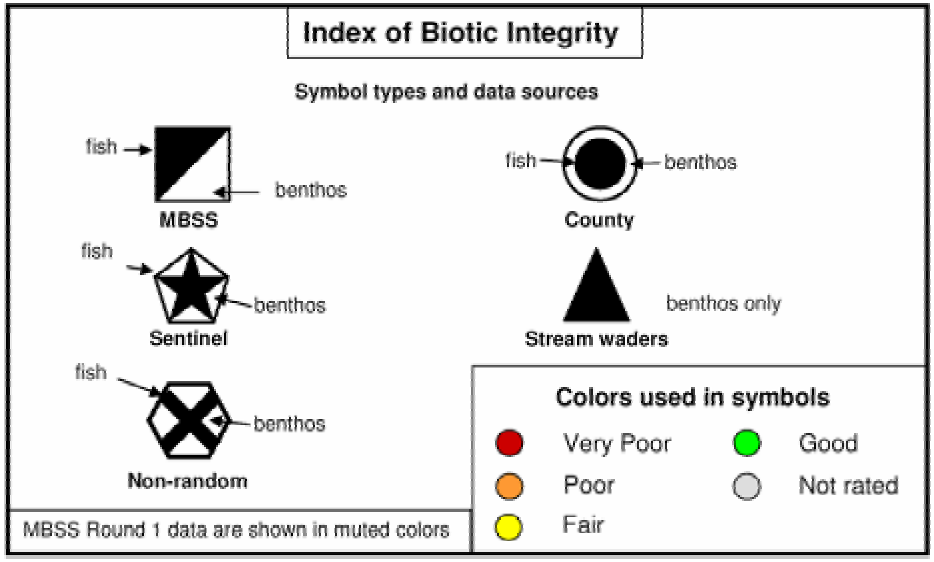
At 100% of stream miles, the most extensive stressor characterized by the MBSS in Baltimore City during the 2000-2004 MBSS was streams with watershed land use >5% urban (Figure 8-5). Other stressors found commonly were: non-native terrestrial plants in the riparian zone (86%of stream miles); non-native aquatic fauna (present in 53% of stream miles); channelized streams (25% of stream miles); low dissolved oxygen (observed in 23% of stream miles); areas with bank erosion problems (19% of stream miles); areas with no riparian buffer (9% of stream miles); and acid deposition (9% of stream miles).

AN IMPORTANT NOTE ON BIODIVERSITY MANAGEMENT

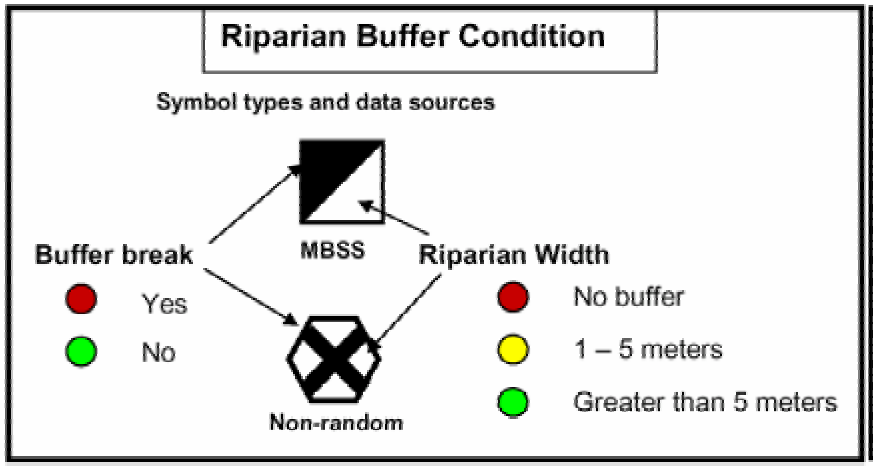
Perhaps the largest ongoing natural resources restoration and protection effort in Maryland is associated with the Chesapeake Bay. In most cases, freshwater biodiversity is not specifically considered during placement and prioritization of Bay restoration and protection projects. In this report and in the more detailed volume in the series on aquatic biodiversity, a system of biodiversity ranking is presented to provide counties and other stewards with a means to plan appropriate protection and restoration activities in locations where they would most benefit stream and river species. Given the historically low level of funding for biodiversity protection and restoration in Maryland and elsewhere, the potential benefit of incorporating freshwater biodiversity needs into other efforts is quite large.

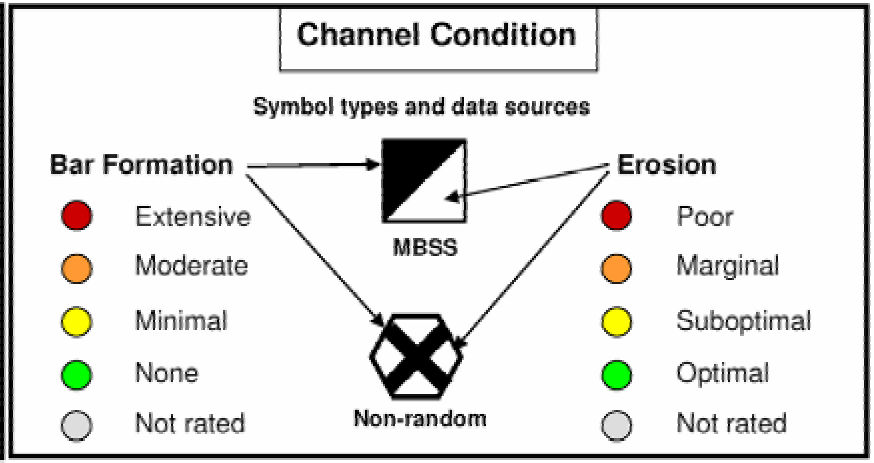
However, it is important to note that although freshwater taxa are the most imperiled group of organisms in Maryland, other groups and individual species not typically found in freshwater habitats are also at high risk and constitute high priority targets for conservation. In addition, freshwater taxa that prefer habitats such as small wetlands may not be well-characterized by the ranking system employed here. To conserve the full array of Maryland's flora and fauna, it is clearly necessary to use other, landscape-based tools and consider factors such as maintaining or reconnecting terrestrial travel corridors.

Key to MBSS 2000-2004 County Maps



Tier 1:	Stronghold watershed (most robust remaining population) for one or more state-listed fish, aquatic herpetofauna, or freshwater mussels.
Tier 2:	Stronghold watershed for one or more non-state listed species of greatest conservation need (GCN) fish, aquatic herpetofauna, or freshwater mussels, that also had state-listed fish, aquatic herpetofauna, or freshwater mussels present.
Tier 3:	Stronghold watershed for one or more non-state listed GCN fish, aquatic herpetofauna, or freshwater mussels, no state-listed fish, aquatic herpetofauna, or freshwater mussels present.
Tier 4:	Non-stronghold watershed with one or more state-listed fish, aquatic herpetofauna, or freshwater mussels present.
Tier 5:	Not of the above, but a biodiversity conservation watershed. In other words, part of the network of watersheds that must be conserved to keep all native fishes, aquatic herpetofauna, freshwater mussels, and rare, pollution sensitive benthic macroinvertebrates extant in Maryland.
Tier 6:	Not of the above.





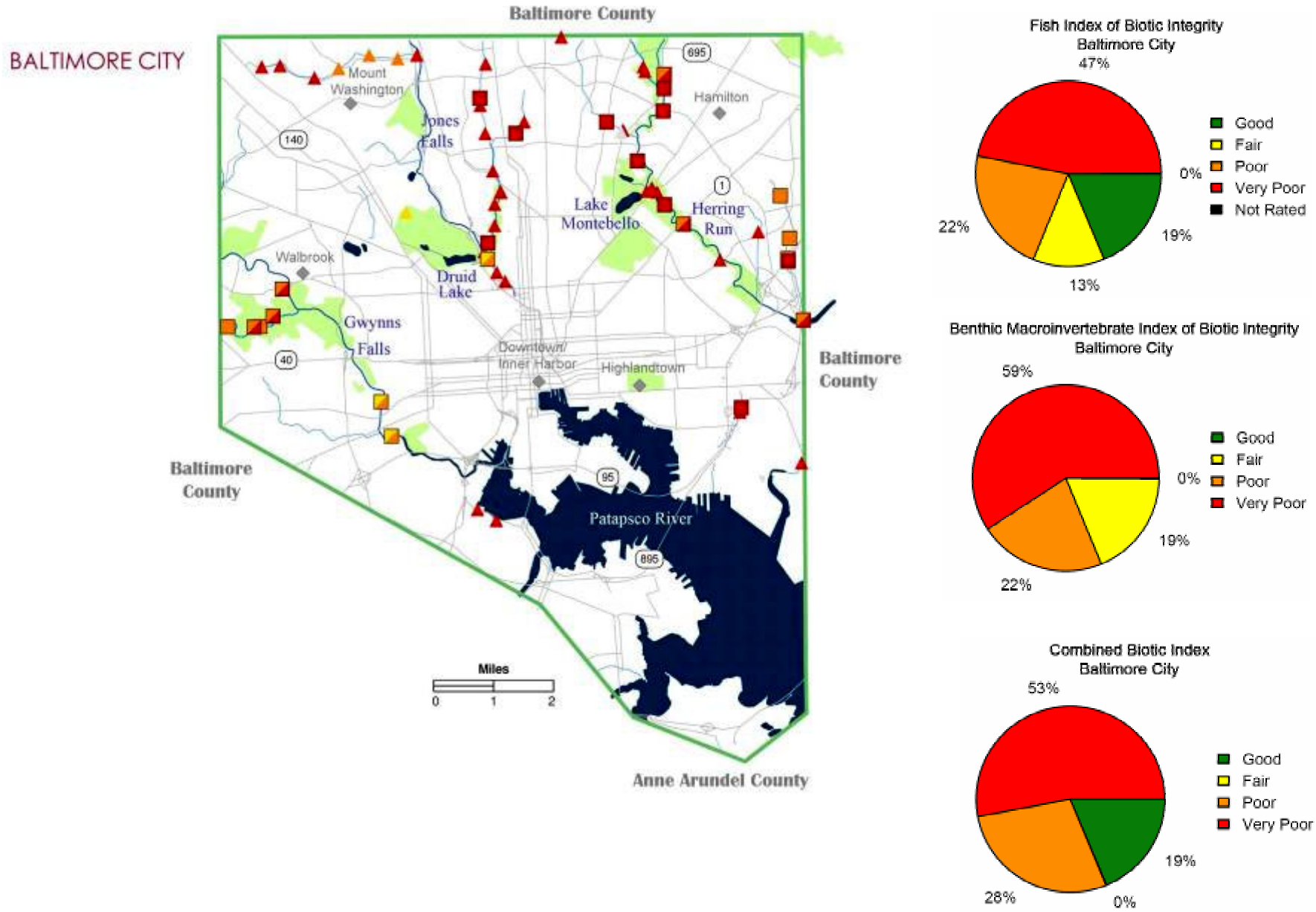


Figure 8-33. Benthic Index of Biotic Integrity (BIBI) and Fish Index of Biotic Integrity (FIBI) pie charts and map of stream health for Baltimore City streams sampled by the MBSS during 1995-97 and 2000-2004 (pie chart represents 2000-2004 data only, Combined Biotic Index pie chart represents mean of FIBI and BIBI).

Table 8-11. MBSS sites sampled in Baltimore City during 1994- 2004, ranked by Combined Biotic Index Score (CBI)

Baltimore City - MBSS Sites

SITE NUMBER	STREAM NAME	WATERSHED	CBI
Best (in order of CBI score)			
JONE-312-R-2002	Jones Falls	Jones Falls	3.00

SITE NUMBER	STREAM NAME	WATERSHED	CBI
Worst (most degraded sites first)			
BC-N-012-120-96	Stony Run	Jones Falls	1.00
BC-P-004-107-96	Chinquapin Run	Back River	1.33
JONE-102-R-2002	Stony Run	Jones Falls	1.33
JONE-105-R-2002	Stony Run UT	Jones Falls	1.33
BC-N-014-216-95	Moore's Run	Back River	1.48
BC-N-015-202-96	Herring Run	Back River	1.50
BC-P-003-228-96	Herring Run	Back River	1.50
GWYN-211-R-2004	Dead Run	Gwynns Falls	1.67
BACK-302-R-2002	Herring Run (PP)	Back River	1.67
BACK-306-R-2002	Herring Run (PP)	Back River	1.67
BC-N-015-219-95	Herring Run	Back River	1.83
BC-P-003-205-95	Herring Run	Back River	2.00
GWYN-210-R-2004	Dead Run	Gwynns Falls	2.00
BC-P-005-318-96	Dead Run	Gwynns Falls	2.00
BC-P-001-326-96	Gwynns Falls	Gwynns Falls	2.17
BC-N-014-217-96	Moore's Run	Back River	2.17
BC-P-005-306-96	Dead Run	Gwynns Falls	2.17
BACK-112-R-2002	Moore's Run	Back River	2.24
BC-N-014-224-95	Moore's Run	Back River	2.26
GWYN-306-R-2004	Gwynns Falls	Gwynns Falls	2.67
GWYN-301-R-2004	Gwynns Falls	Gwynns Falls	2.83

Table 8-12 Stream Waders sites sampled in Baltimore City during 2000-2004, ranked by the Family-level Benthic Index of Biotic Integrity

Baltimore City - Stream Wader Sites				
WATERSHED	# GOOD	# FAIR	# POOR	# VERY POOR
Back River	0	0	0	7
Baltimore Harbor	0	0	0	4
Gwynns Falls	0	0	0	3
Jones Falls	0	0	3	17

The Balitmore City Department of Public Works began a multi-year, rotating basin sampling program for streams in 2002. The primary goals of the Baltimore City biomonitoring program are to assess the ecological status of City streams and watersheds and to establish a baseline for comparing future assessments. Results will also be related to programmatic activities, such as BMP siting, installation, and evaluation; stormwater discharge permits; and contributing to restoration initiatives.

The City's overall sampling design was developed to be directly comparable to the MBSS to allow for the sharing of data among agencies. Final selection and placement of sampling segments was random and stratified by subwatershed and stream order. Thirty sites in one of three major watersheds (Gwynns Falls, Jones Falls, Herring Run) are sampled yearly, with each watershed being sampled within three years. To date, each watershed has been sampled one time. An additional fifteen non-random sites are sampled annually to track long-term trends.

Benthic macroinvertebrate sampling is completed during the spring index period, fish monitoring is completed during the fall index period and physical habitat assessments are completed during both. All are done in accordance with the MBSS Sampling Manual (Kazyak 2001). Laboratory processing of benthic macroinvertebrates were consistent with MBSS methods outlined in Boward and Friedman (2000) and MBSS IBIs (Stribling et al. 1998) were calculated for each site, with emphasis on an urbanization metric developed by Baltimore City (EA Engineering, Science, and Technology, Inc. 2001).

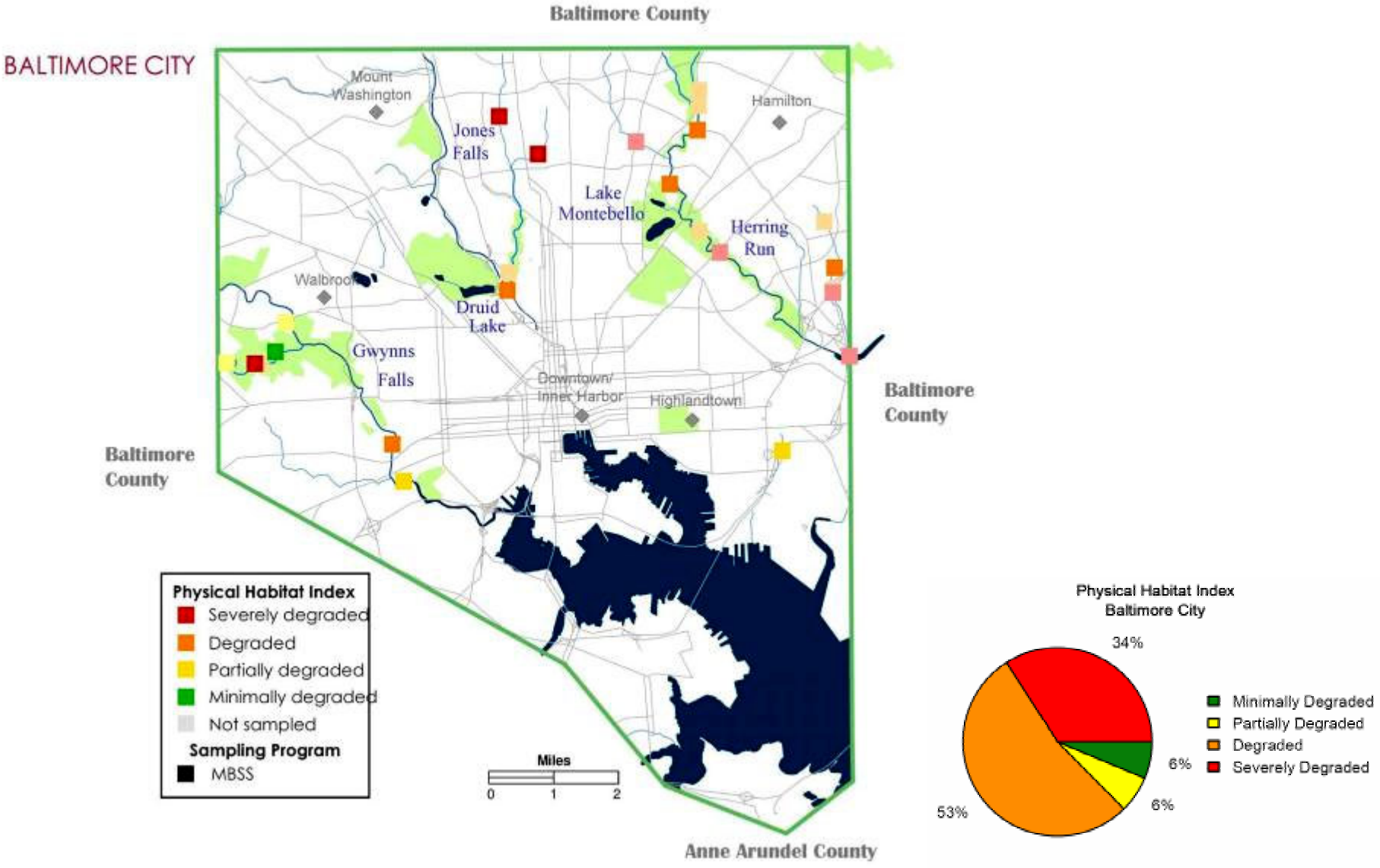


Figure 8-34. Physical Habitat Index (PHI) pie chart and map of stream habitat quality for Baltimore City streams sampled by the MBSS during 1995-97 and 2000-2004 (pie chart represents 2000-2004 data only)

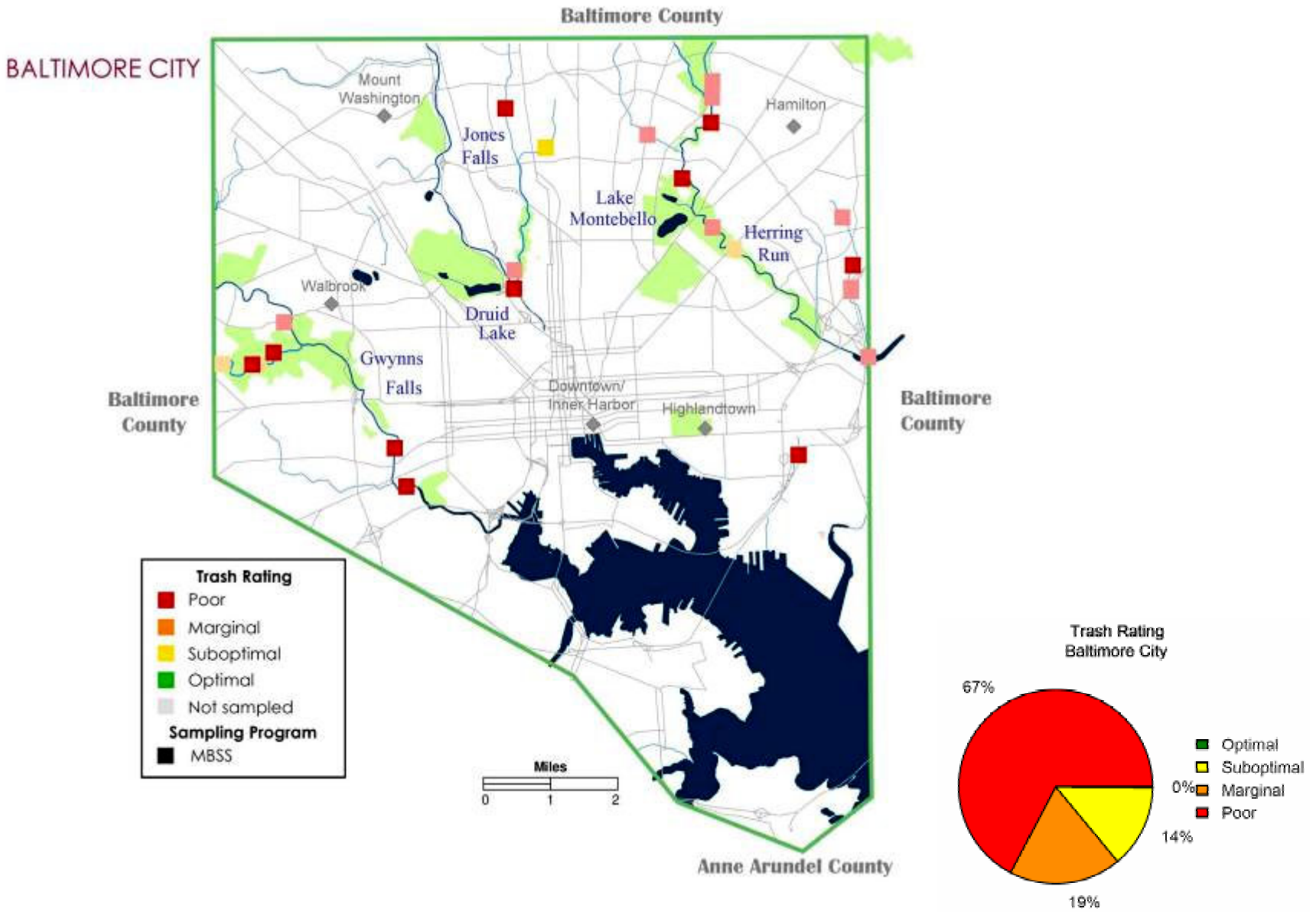


Figure 8-35. Pie chart and map of trash rating (0-20 scale) for Baltimore City streams sampled by the MBSS during 1995-97 and 2000-2004 (pie chart represents 2000-2004 data only)

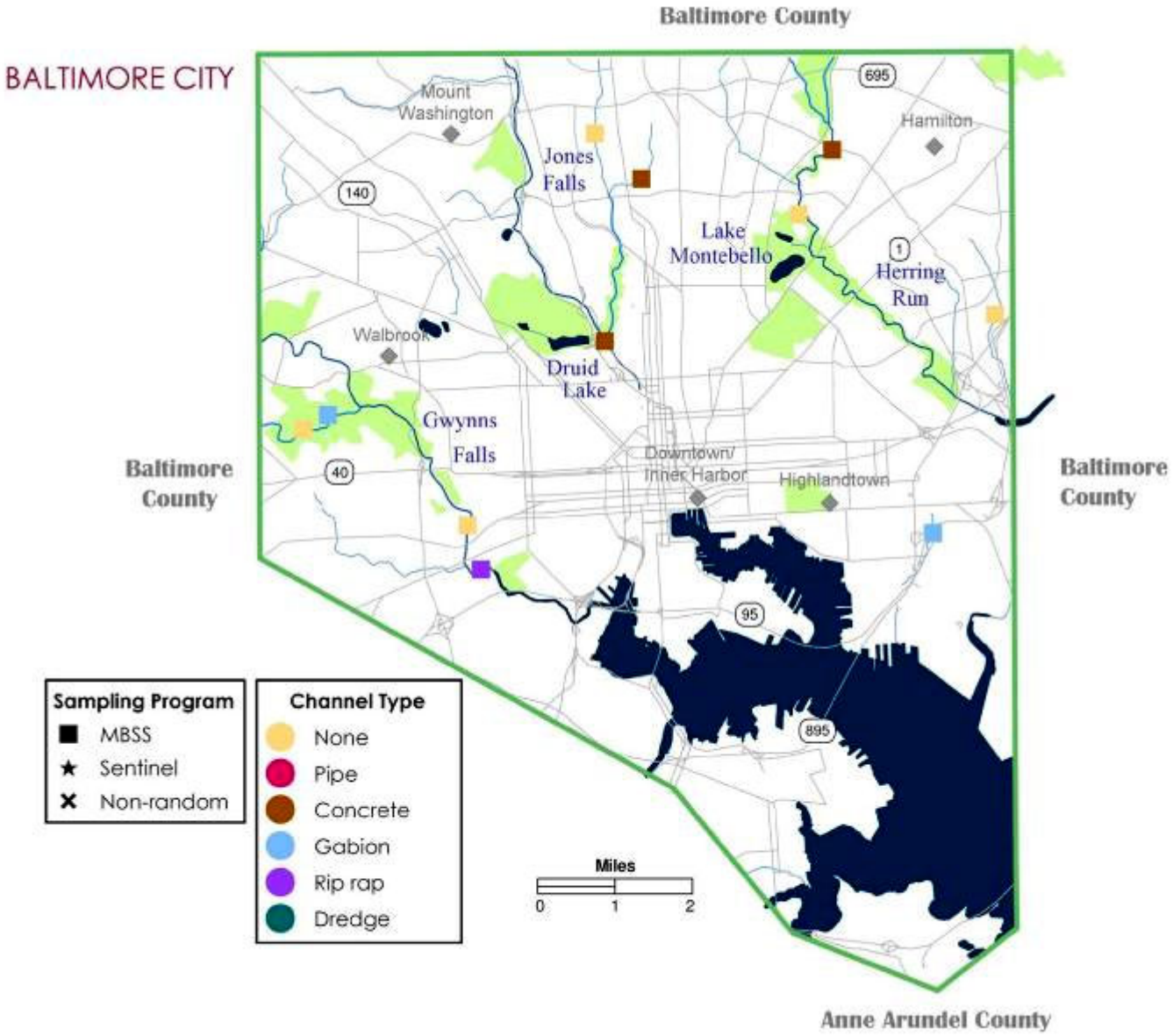


Figure 8-36. Map of channelized sites, by type, for Baltimore City streams sampled by the MBSS during 2000-2004. *NOTE: When channelization is indicated, it does not necessarily mean that the entire 75m segment was affected.*

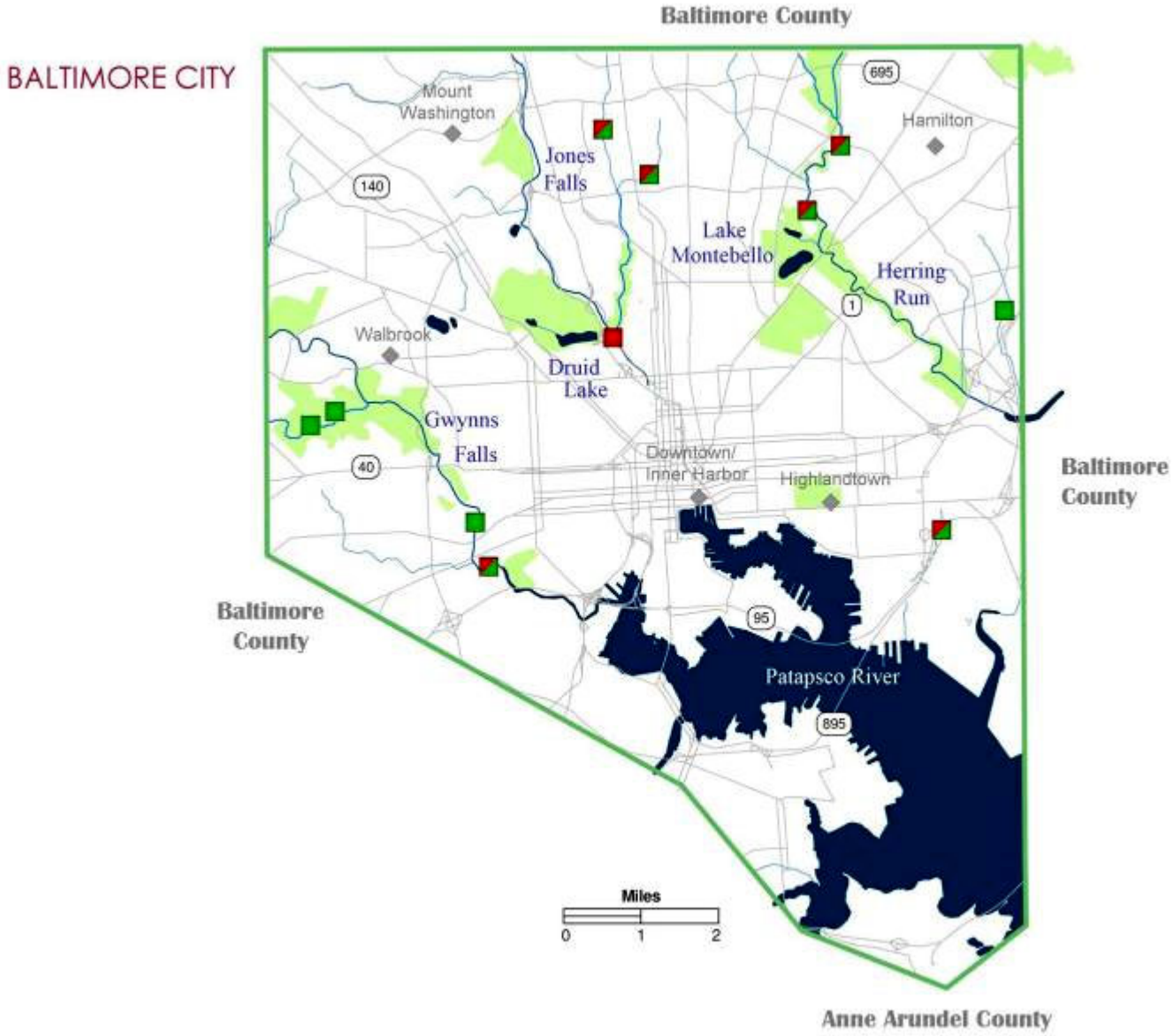


Figure 8-37. Map of sites with inadequate riparian buffers and buffer breaks for Baltimore City streams sampled by the MBSS during 2000-2004. *NOTE: Multiple riparian buffer breaks sometimes occurred at a site; only the most severe was depicted.*

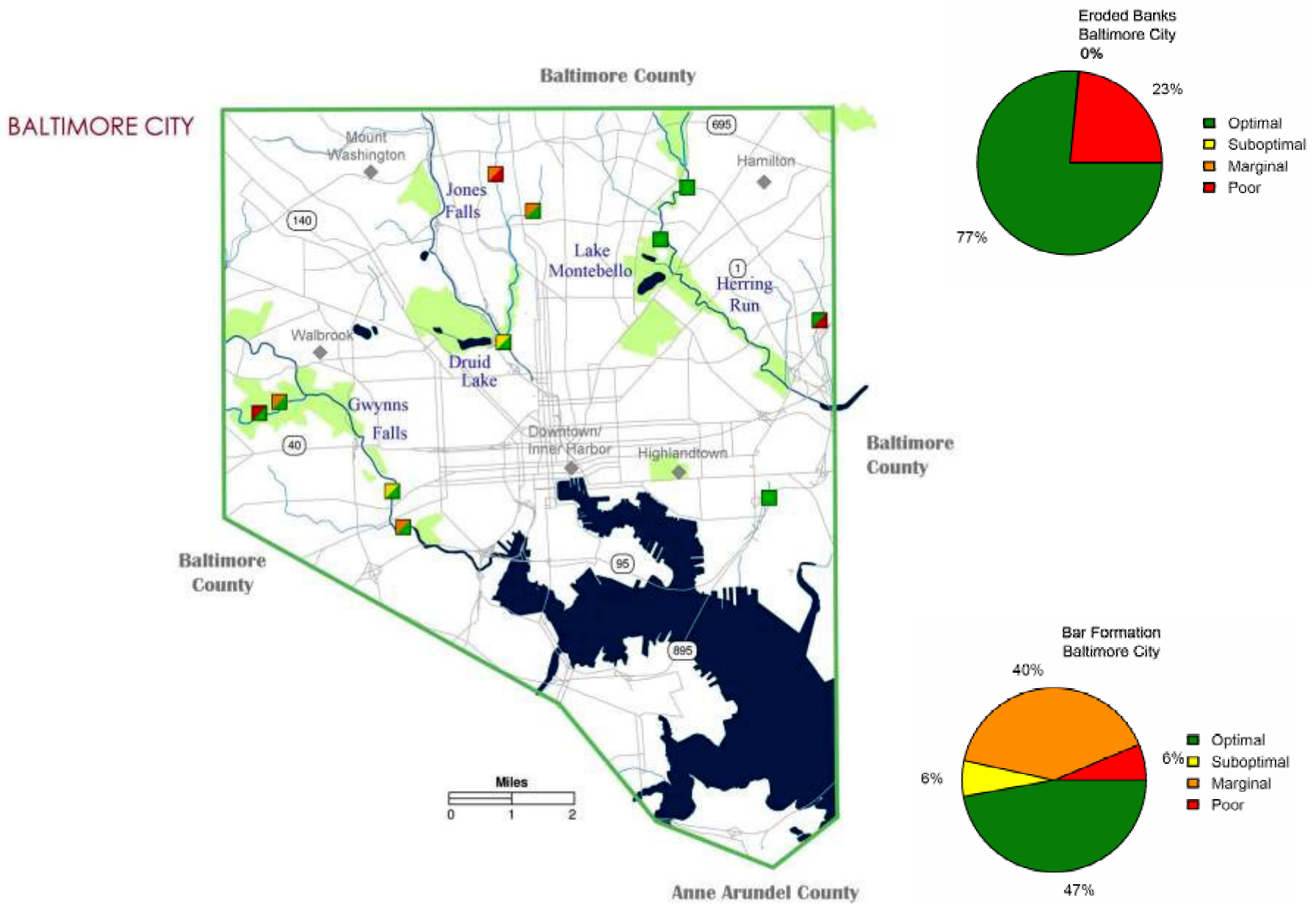


Figure 8-38. Pie charts and map of sites with eroded banks and instream bar formation for Baltimore City streams sampled by the MBSS during 2000-2004

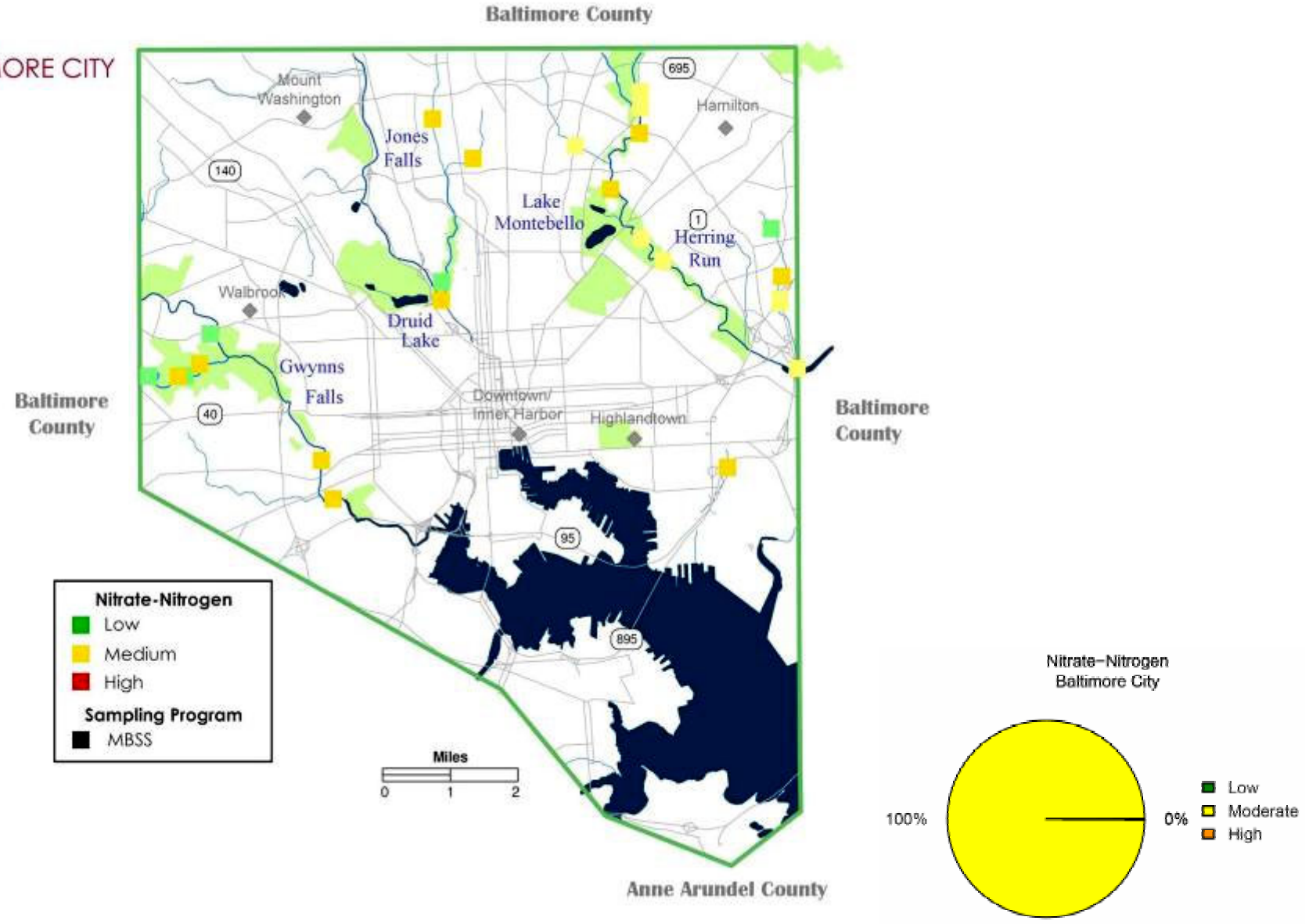


Figure 8-39. Pie chart and map of nitrate-nitrogen values (mg/l) for Baltimore City streams sampled by the MBSS during 1995-97 and 2000-2004 (pie chart represents 2000-2004 data only) (Low = 1.0, Medium = 1.0 – 5.0, High = > 5.0)

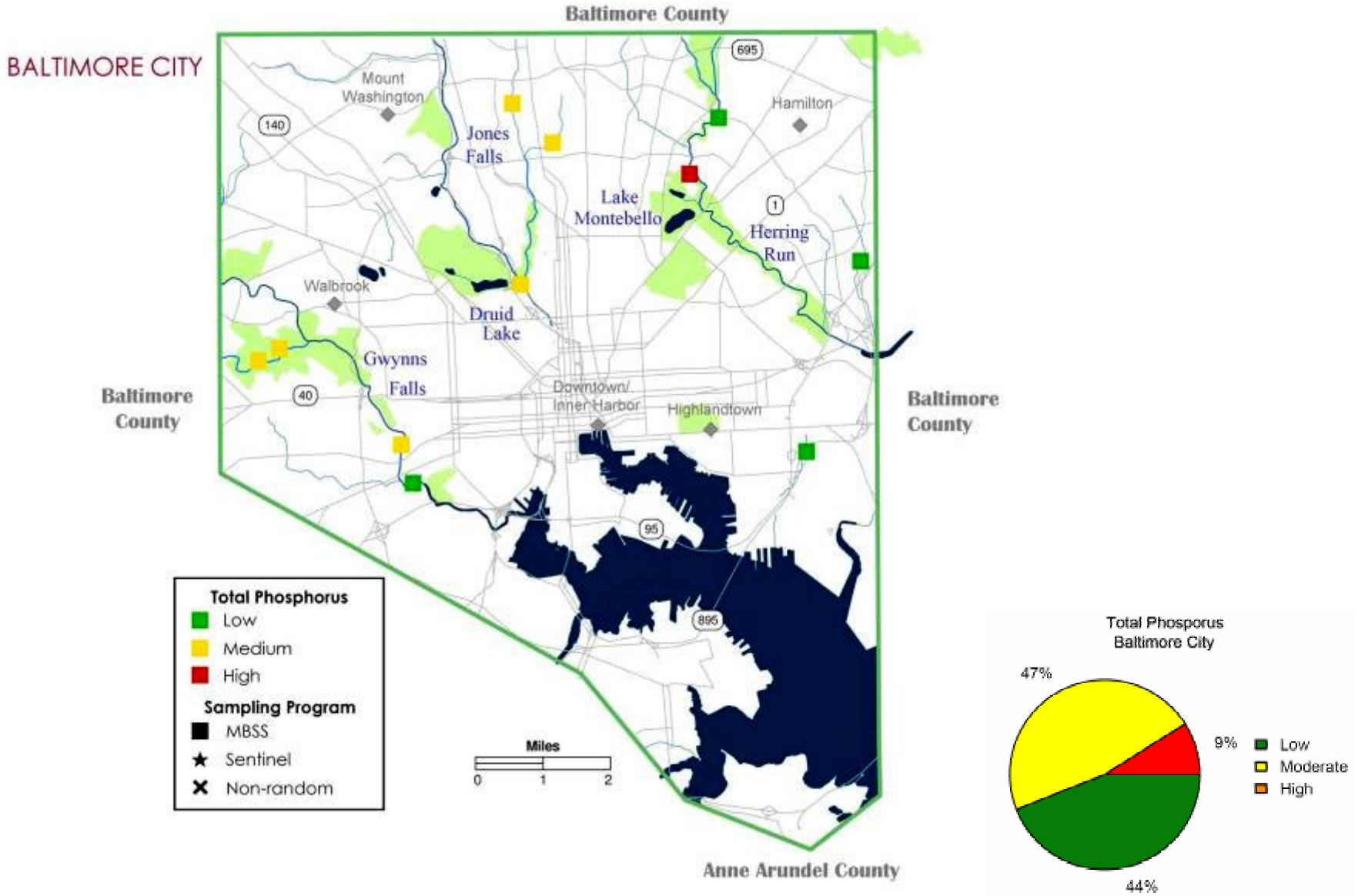


Figure 8-40. Pie chart and map of total phosphorus values (mg/l) for Baltimore City streams sampled by the MBSS during 2000-2004 (Low = < 0.025, Medium = 0.025 – 0.07, High = > 0.07)

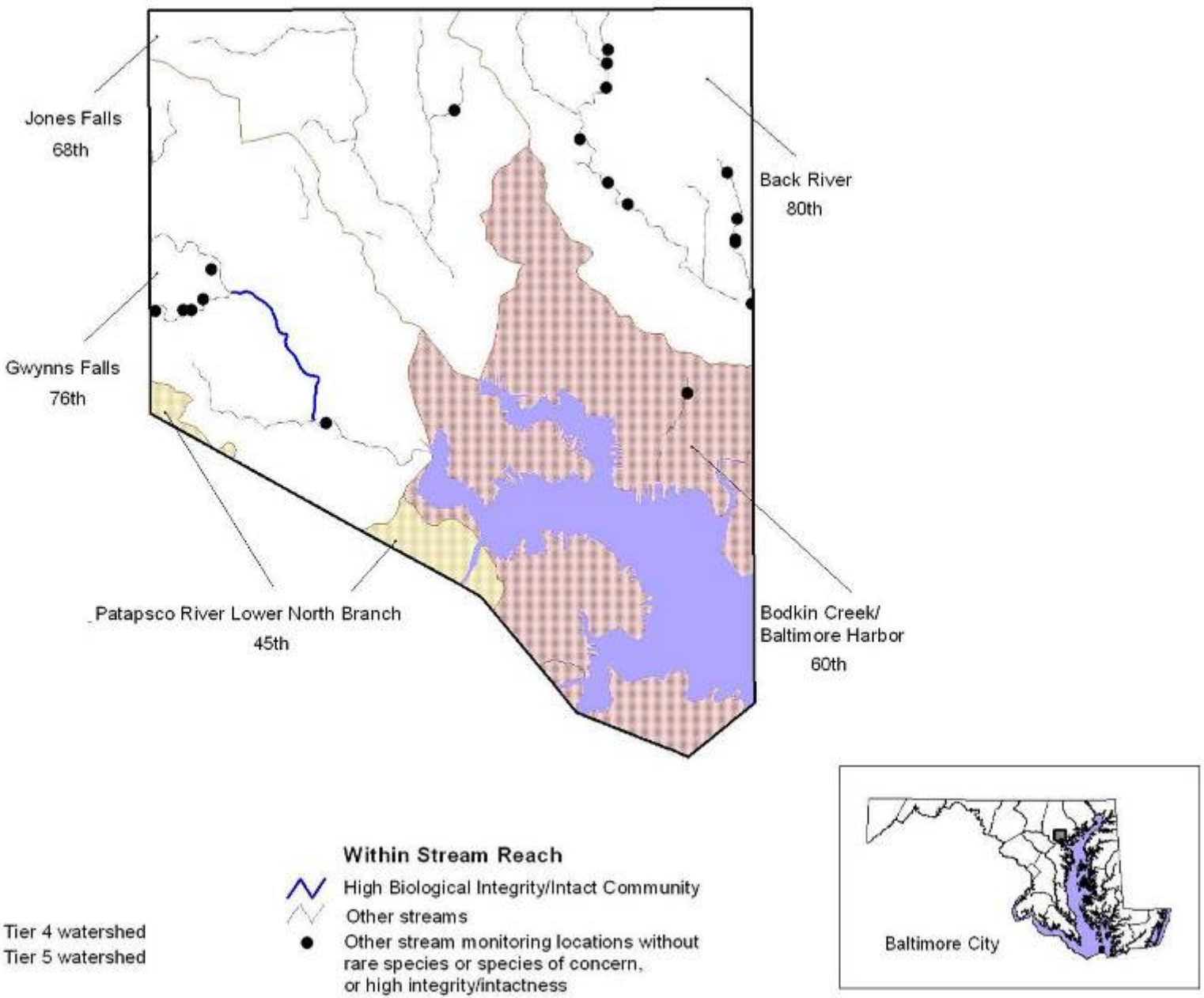


Figure 8-41. Aquatic Heritage Biodiversity Ranking map for Baltimore City, by watershed. Data from MBSS 1994-2004, MBSS qualitative data, Raesly, unpub. data, Harris 1975, Thompson 1984, and DNR Natural Heritage Program database.